CLAIMS

1.   A bandwidth control system for a network, the network having a host computer that includes a first network interface and a second network interface, the bandwidth control system comprising:

5   a packet driver adapted to be executed on the host computer, the packet driver logically connected to the first network interface and the second network interface, the packet driver capturing packets received from the network on the first network interface; and

          a traffic shaper adapted to be executed on the host computer, the traffic shaper maintaining a topology representation of the network, the topology representation including one or more nodes, the traffic shaper performing priority and packet rate metering functions on the 10 captured packets to match a set of rate conditions unique to each node in the topology representation of the network, and returning the captured packets to the packet driver for transmission to the network on the second network interface.

15   2.   The bandwidth control system of claim 1 wherein the nodes in the topology representation of the network comprise a hierarchy of arbitrary physical and logical aggregation points that form a logical representation of the network and its underlying physical elements.

3.   The bandwidth control system of claim 2 wherein the nodes represent elements 20 from the group consisting of interfaces, gateways, subnets, groups, addresses, protocols, routers or applications.

4.   The bandwidth control system of claim 1 further comprising a configuration interface, wherein the configuration interface specifies operating parameters and the topology 25 representation of the network to the traffic shaper.

5.   The bandwidth control system of claim 4 wherein the configuration interface further provides interactive operational and statistical information concerning the traffic shaper and the topology representation of the network maintained by the shaper.

30

24

6. The bandwidth control system of claim 1 wherein the traffic shaper maintains discrete topology representations of the network for both an inbound flow of traffic in the network and an outbound flow of traffic in the network.

7. The bandwidth control system of claim 6 wherein the traffic shaper utilizes independent rate conditions for the inbound flow of traffic in the network and the outbound flow of traffic in the network in performing priority and packet rate metering functions on the captured packets.

8. The bandwidth control system of claim 1 wherein the set of rate conditions unique to each node in the topology representation of the network includes a normal rate set, which is used when none of the node's ancestors are currently in a congested state, and a congested rate set, which is used when one or more of the node's ancestors is currently in the congested state.

9. A method of managing bandwidth in a network, the network having a host computer that includes a first network interface and a second network interface, the method comprising:

(a) constructing a topology representation of the network, the topology representation including one or more nodes;

(b) receiving packets from the network on the first network interface;

(c) prioritizing and shaping the received packets to match a set of rate conditions unique to each node in the topology representation of the network; and

(d) transmitting the prioritized and shaped packets to the network on the second network interface.

10. The method of claim 9 wherein the nodes in the topology representation of the network comprise a hierarchy of arbitrary physical and logical aggregation points that form a logical representation of the network and its underlying physical elements.

11. The method of claim 10 wherein the nodes represent elements from the group consisting of interfaces, gateways, subnets, groups, addresses, protocols, routers or applications.

12. The method of claim 9 wherein in step (a) a topology representation of the network is constructed for both an inbound flow of traffic in the network and an outbound flow of traffic in the network.

13. The method of claim 12 wherein in step (c) independent rate conditions for the inbound flow of traffic in the network and the outbound flow of traffic in the network are used to prioritize and shape the received packets.

14. The method of claim 9 wherein step (c) further comprises:

     (i)   examining the source and destination addresses of the received packets;

     (ii)   pairing the received packets with shaping objects within the topology representation of the network; and

     (iii)   performing priority and packet rate metering functions on the received packets.

15. The method of claim 9 wherein the set of rate conditions unique to each node in the topology representation of the network includes a normal rate set, which is used when none of the node's ancestors are currently in a congested state, and a congested rate set, which is used when one or more of the node's ancestors is currently in the congested state.

16. An article of manufacture for managing bandwidth in a network, the network having a host computer that includes a first network interface and a second network interface, the article of manufacture comprising a computer-readable medium holding computer-executable instructions for performing a method comprising:

     (a)   constructing a topology representation of the network, the topology representation including one or more nodes;

     (b)   receiving packets from the network on the first network interface;

     (c)   prioritizing and shaping the received packets to match a set of rate

26

conditions unique to each node in the topology representation of the network; and

        (d)   transmitting the prioritized and shaped packets to the network on the second network interface.

17.   The article of manufacture of claim 16 wherein the nodes in the topology representation of the network comprise a hierarchy of arbitrary physical and logical aggregation points that form a logical representation of the network and its underlying physical elements.

18.   The article of manufacture of claim 17 wherein the nodes represent elements from the group consisting of interfaces, gateways, subnets, groups, addresses, protocols, routers or applications.

19.   The article of manufacture of claim 16 wherein in step (a) a topology representation of the network is constructed for both an inbound flow of traffic in the network and an outbound flow of traffic in the network.

20.   The article of manufacture of claim 19 wherein in step (c) independent rate conditions for the inbound flow of traffic in the network and the outbound flow of traffic in the network are used to prioritize and shape the received packets.

21.   The article of manufacture of claim 16 wherein step (c) further comprises:

        (i)   examining the source and destination addresses of the received packets;

        (ii)   pairing the received packets with shaping objects within the topology representation of the network; and

        (iii)   performing priority and packet rate metering functions on the received packets.

22.   The article of manufacture of claim 16 wherein the set of rate conditions unique to each node in the topology representation of the network includes a normal rate set, which is used when none of the node's ancestors are currently in a congested state, and a congested rate set, which is used when one or more of the node's ancestors is currently in the congested state.

27